



[4910-13]

## **DEPARTMENT OF TRANSPORTATION**

### **Federal Aviation Administration**

#### **14 CFR Part 21**

#### **Final Additional Airworthiness Design Standards: Night Visual Flight Rules (VFR)**

#### **Under the Special Class (JAR-VLA) Regulations ; AQUILA Aviation by Excellence**

#### **GmbH, Model AT01**

**AGENCY:** Federal Aviation Administration (FAA), DOT.

**ACTION:** Issuance of airworthiness design standards.

**SUMMARY:** This document is an issuance of Final Airworthiness design criteria for night visual flight rules (VFR) expansion and substantiation for the Aquila GmbH AT01. These additional provisions are expansions of the existing JAR-VLA (Joint Aviation Requirements-Very Light Aircraft) and CS-VLA regulations to include Night-VFR. The current regulations only allow Day-VFR, but the European Aviation Safety Agency (EASA) is expanding the VLA regulations for this type of airplane through EASA special conditions. These FAA design criteria are being proposed to be the same as the EASA Special Conditions. The original certification of the aircraft was done under the provisions of 14 CFR part 21, § 21.29, as a 14 CFR part 21, § 21.17(b), special class aircraft, JAR-VLA, using the requirements of JAR-VLA Amendment VLA/92/01 as developed by the Joint Aviation Authority, and under Title 14 of the Code of Federal Regulations and two additional design criteria issued on September 2, 2003 (68 FR 56809).

**DATES:** Effective [INSERT DATE 30 DAYS AFTER PUBLICATION IN THE FEDERAL REGISTER].

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**SUPPLEMENTARY INFORMATION:** Any person may obtain a copy of this information by contacting the person named above under **FOR FURTHER INFORMATION CONTACT**.

### **Background**

The regulation applicable to the Amended Type Certificate (TC) Night-VFR approval is § 21.17(b). This section describes the regulatory basis for the approval of JAR-VLA and CS-VLA aircraft as a special class. Policy on this subject includes AC 23-11B and AC 21.17-3.

Airworthiness rules that are applicable to this Night-VFR approval are §§ 23.1381 through 23.1397 and 23.1401.

FAA policy expressed in ACs 23-11B and 21.17-3 limits JAR-VLA and CS-VLA aircraft approved under § 21.17(b), to Day-VFR operations. Part 23 certification was required for Night-VFR approval because the VLA rules were not adequate to address Night-VFR operations. Since publishing these advisory circulars, EASA has developed special conditions to CS-VLA that are adequate to allow Night-VFR approvals. If the applicant complies with the applicable airworthiness rules in CS-VLA and the EASA special conditions, the previous policy disallowing Night-VFR is no longer valid.

Airplanes approved as special class under § 21.17(b) may be type certificated as both Day-VFR and Night-VFR if the certification includes the required instrumentation and equipment specified in 14 CFR 91.205, and the certification basis includes the applicable rules of CS-VLA at date of application and the appropriate EASA special conditions.

The FAA has concluded that it is acceptable to allow Night-VFR certification for the Aquila Model AT01 and future JAR-VLA (CS-VLA) models under the special class amended TC project AT00617CE-A. Revisions to ACs 23-11B and 21.17-3 will be made to allow this expansion to Night-VFR on other JAR-VLA (CS-VLA) airplanes.

### **Discussion of Comments**

Existence of proposed airworthiness standards for acceptance under 14 CFR part 21, § 21.17(b), special class aircraft, JAR-VLA; the AQUILA Model AT01 was published in the Federal Register on Friday May 31, 2013, 78 FR 32576. No comments were received, and the airworthiness design standards are adopted.

### **Applicability**

As discussed above, these airworthiness design standards under the special class, JAR-VLA rule are applicable to the Aquila AT01 model and future JAR-VLA (CS-VLA) models on FAA TCDS A51CE.

### **Conclusion**

This action affects only certain airworthiness design standards on Aquila AT01 model and future JAR-VLA model airplanes shown on FAA TCDS A51CE. It is not a standard of general applicability and it affects only the applicant who applied to the FAA for approval of these features on the airplane.

### **Citation**

The authority citation for these airworthiness standards is as follows:

Authority: 49 U.S.C. 106(g), 40113 and 44701.

To satisfy the additional required provisions of “Proposed Airworthiness Design Standards: Night visual flight rules (VFR) Under the Special Class (JAR-VLA) Regulations of 14 CFR Part 21.17(b); AQUILA Aviation by Excellence GmbH, Model AT01”, the applicant, AQUILA, has submitted a request to the FAA to use the EASA Special Conditions as shown on EASA Certification Review Item (CRI) A-01 Issue 3, Appendix1, dated October 3, 2010 “EASA Special Condition Airworthiness standards for CS-VLA aeroplane to be operated under Night-VFR operations. Applicable to AQUILA AT01”as follows:

## **Appendix 1**

### **Special Condition**

#### **Airworthiness standards for CS-VLA aeroplane to be operated under night-VFR operations.**

#### **Applicable to AQUILA AT01**

Instead of VLA 1, VLA 181, VLA 773, VLA 807, VLA 903, VLA 905, VLA 1121, VLA 1143, VLA 1147, VLA 1322, VLA 1325, VLA 1331, VLA 1351, VLA 1353, VLA 1431, VLA 1547, VLA 1559, VLA 1583 and due to absence of specific requirements in CS-VLA (*VLA 1107, VLA 1381, VLA 1383*) the following proposed Special Conditions have to be complied with:

#### **SpC VLA 1    Applicability**

This airworthiness code is applicable to aeroplanes with a single engine (spark- or compression-ignition) having not more than two seats, with a Maximum Certificated Take-off Weight of not more than 750 kg and a stalling speed in the landing configuration of not more than 83 km/h (45 knots)(CAS), to be approved for day-VFR or for day- and night VFR. (See AMC VLA 1.)

#### **SpC VLA 181    Dynamic Stability**

(a) Any short period oscillation not including combined lateral-directional oscillations occurring between the stalling speed and the maximum allowable speed appropriate to the configuration of the aeroplane must be 'heavily damped with the primary controls –

- (1) Free; and
- (2) In a fixed position

(b) Any combined lateral-directional oscillations ('Dutch roll') occurring between the stalling speed and the maximum allowable speed appropriate to the configuration of the aeroplane must be damped to 1/10 amplitude in 7 cycles with the primary controls –

- (1) Free; and paragraph must be shown under the following
- (2) In a fixed position.

(c) Any long period oscillation of the flight path (phugoid) must not be so unstable as to cause an unacceptable increase in pilot workload or otherwise endanger the aeroplane. When in the conditions of CS VLA 175, the longitudinal control force

required to maintain speeds differing from the trimmed speed by at least plus or minus 15% is suddenly released; the response of the aeroplane must not exhibit any dangerous characteristics nor be excessive in relation to the magnitude of the control force released (see AMC VLA 181 (c)).

### **SpC VLA 773 Pilot compartment view**

The pilot compartment must be free from glare and reflections that could interfere with the pilot's vision in all operations for which the certification is requested. The pilot compartment must be designed so that –

- (a) The pilot's view is sufficiently extensive, clear, and undistorted, for safe operation;
- (b) The pilot is protected from the elements so that moderate rain conditions do not unduly impair his view of the flight path in normal flight and while landing; and
- (c) Internal fogging of the windows covered under sub-paragraph (a) of this paragraph can be easily cleared by the pilot unless means are provided to prevent fogging. (See AMC VLA 773.)

### **SpC VLA807 Emergency Exits**

(a) Where exits are provided to achieve compliance with CS-VLA 783 (a), the opening system must be designed for simple and easy operation. It must function rapidly and be designed so that it can be operated by each occupant strapped in his seat, and also from outside the cockpit. Reasonable provisions must be provided to prevent jamming by fuselage deformation.

(b) Markings must be suitable for night VFR, if this kind of operation is requested. (See AMC VLA 807 (b))

### **SpC VLA903 Engine**

(a) The engine must meet the specifications of CS-22 Subpart H for day-VFR operation, and must meet the Specification of CS-E for night-VFR operation.

(b) Restart capability. An altitude and airspeed envelope must be established for the aeroplane for in-flight engine restarting and the installed engine must have a restart capability within that envelope.

#### **SpC VLA      905 Propeller**

(a) The propeller must meet the specifications of CS-22 Subpart J for day-VFR operation. For night-VFR operations the Propeller and the Control System must meet the Specification of CS-P except for fixed pitch propellers, for which CS-22 Subpart J is sufficient.

(b) Engine power and propeller shaft rotational speed may not exceed the limits for which the propeller is certificated or approved.

#### **SpC VLA      1107 Induction System Filters**

On reciprocating-engine installations, if an air filter is used to protect the engine against foreign material particles in the induction air supply—

(a) Each air filter must be capable of withstanding the effects of temperature extremes, rain, fuel, oil, and solvents to which it is expected to be exposed in service and maintenance; and

(b) Each air filter must have a design feature to prevent material separated from the filter media from re-entering the induction system and interfering with proper fuel metering operation.

#### **SpC VLA 1121      Exhaust System: General**

(a) Each exhaust system must ensure safe disposal of exhaust gases without fire hazard or carbon monoxide contamination in the personnel compartment.

(b) Each exhaust system part with a surface hot enough to ignite flammable fluids or vapours must be located or shielded so that leakage from any system carrying flammable fluids or vapours will not result in a fire caused by impingement of the fluids or vapours on any part of the exhaust system including shields for the exhaust system.

(c) Each exhaust system component must be separated by fireproof shields from adjacent flammable parts of the aeroplane that are outside the engine compartment.

- (d) No exhaust gases may discharge dangerously near any fuel or oil system drain.
- (e) No exhaust gases may be discharged where they will cause a glare seriously affecting the pilot's vision at night.
- (f) Each exhaust system component must be ventilated to prevent points of excessively high temperature.
- (g) Each exhaust heat exchanger must incorporate means to prevent blockage of the exhaust port after any internal heat exchanger failure.

### **SpC VLA 1143     Engine Controls**

- (a) The power or supercharger control must give a positive and immediate responsive means of controlling its engine or supercharger.
- (b) If a power control incorporates a fuel shut-off feature, the control must have a means to prevent the inadvertent movement of the control into the shut-off position. The means must –
  - (1) Have a positive lock or stop at the idle position; and
  - (2) Require a separate and distinct operation to place the control in the shut-off position.
- (c) For reciprocating single-engine aeroplanes, each power or thrust control must be designed so that if the control separates at the engine fuel metering device, the aeroplane is capable of continuing safe flight and landing. (See AMC VLA 1143(c)).

### **SpC VLA 1147     Mixture Control**

- (a) The Control must require a separate and distinct operation to move the control toward lean or shut-off position.
- (b) Each manual engine mixture control must be designed so that, if the control separates at the engine fuel metering device, the aeroplane is capable of continuing safe flight and landing. (See AMC VLA 1147(b)).



### **SpC VLA 1322      Warning, caution, and advisory lights**

If warning, caution, or advisory lights are installed in the cockpit, they must be –

- (a) Red, for warning lights (lights indicating a hazard which may require immediate corrective action);
- (b) Amber, for caution lights (lights indicating the possible need for future corrective action);
- (c) Green, for safe operation lights; and
- (d) Any other colour, including white, for lights not described in sub-paragraphs (a) to (c) of this paragraph, provided the colour differs sufficiently from the colours prescribed in subparagraphs (a) to (c) of this paragraph to avoid possible confusion.
- (e) Effective under all probable cockpit lighting conditions.

### **SpC VLA 1325      Static pressure system**

- (a) Each instrument provided with static pressure case connections must be so vented that the influence of aeroplane speed, the opening and closing of windows, moisture or other foreign matter, will not significantly affect the accuracy of the instruments.
- (b) The design and installation of a static pressure system must be such that –
  - (1) Positive drainage of moisture is provided;
  - (2) Chafing of the tubing, and excessive distortion or restriction at bends in the tubing, is avoided; and
  - (3) The materials used are durable, suitable for the purpose intended, and protected against corrosion.
- (c) Each static pressure system must be calibrated in flight to determine the system error. The system error, in indicated pressure altitude, at sea-level, with a standard atmosphere, excluding instrument calibration error, may not exceed  $\pm 9$  m ( $\pm 30$  ft) per 185 km/h (100 knot) speed for the appropriate configuration in the speed range between  $1.3 V_{SO}$  with flaps extended and  $1.8 V_{S1}$  with flaps retracted. However, the error need not be less than  $\pm 9$  m ( $\pm 30$  ft).

### **SpC VLA 1331    Instruments using a power supply**

For each aeroplane –

- (a) Each gyroscopic instrument must derive its energy from power sources adequate to maintain its required accuracy at any speed above the best rate-of-climb speed;
- (b) Each gyroscopic instrument must be installed so as to prevent malfunction due to rain, oil and other detrimental elements; and
- (c) There must be a means to indicate the adequacy of the power being supplied to the instruments.
- (d) For night VFR operation there must be at least two independent sources of power and a manual or an automatic means to select each power source for each instrument that uses a power source.

### **SpC VLA 1351    ELECTRICAL SYSTEMS AND EQUIPMENT: General**

(a) *Electrical system capacity.* Each electrical system must be adequate for the intended use. In addition –

(1) Electric power sources, their transmission cables, and their associated control and protective devices, must be able to furnish the required power at the proper voltage to each load circuit essential for safe operation; and

(2) Compliance with sub-paragraph (a)(1) of this paragraph must be shown by an electrical load analysis, or by electrical measurements, that account for the electrical loads applied to the electrical system in probable combinations and for probable durations.

(b) *Functions.* For each electrical system, the following apply:

(1) Each system, when installed, must be –

(i) Free from hazards in itself, in its method of operation, and in its effects on other parts of the aeroplane;

(ii) Protected from fuel, oil, water, other detrimental substances, and mechanical damage; and

(iii) So designed that the risk of electrical shock to occupants and ground personnel is reduced to a minimum.

(2) Electric power sources must function properly when connected in combination or independently.

(3) No failure or malfunction of any electric power source may impair the ability of any remaining source to supply load circuits essential for safe operation.

(4) Each electric power source control must allow the independent operation of each source, except that controls associated with alternators that depend on a battery for initial excitation or for stabilisation need not break the connection between the alternator and its battery.

(c) *Generating system.* There must be at least one generator if the electrical system supplies power to load circuits essential for safe operation. In addition –

(1) Each generator must be able to deliver its continuous rated power;

(2) Generator voltage control equipment must be able to dependably regulate the generator output within rated limits;

(3) Each generator must have a reverse current cut out designed to disconnect the generator from the battery and from the other generators when enough reverse current exists to damage that generator;

(4) There must be a means to give immediate warning to the pilot of a failure of any generator; and

(5) Each generator must have an overvoltage control designed and installed to prevent damage to the electrical system, or to equipment supplied by the electrical system, that could result if that generator were to develop an overvoltage condition.

(d) *Instruments.* There must be a means to indicate to the pilot that the electrical power supplies are adequate for safe operation. For direct current systems, an ammeter in the battery feeder may be used.

(e) *Fire resistance.* Electrical equipment must be so designed and installed that in the event of a fire in the engine compartment, during which the surface of the firewall adjacent to the fire is heated to 1100°C for 5 minutes or to a lesser temperature substantiated by the applicant, the equipment essential to continued safe operation and located behind the firewall will function satisfactorily and will not create an additional fire hazard. This may be shown by test or analysis.

(f) *External power.* If provisions are made for connecting external power to the aeroplane, and that external power can be electrically connected to equipment other than that used for engine starting, means must be provided to ensure that no external power supply having a reverse polarity, or a reverse phase sequence, can supply power to the aeroplane's electrical system. The location must allow such provisions to be capable of being operated without hazard to the aeroplane or persons.

## **SpC VLA 1353      Storage battery design and installation**

(a) Each storage battery must be designed and installed as prescribed in this paragraph.

(b) Safe cell temperatures and pressures must be maintained during any probable charging and discharging condition. No uncontrolled increase in cell temperature may result when the battery is recharged (after previous complete discharge) –

- (1) At maximum regulated voltage or power;
- (2) During a flight of maximum duration; and
- (3) Under the most adverse cooling condition likely to occur in service.

(c) Compliance with sub-paragraph (b) of this paragraph must be shown by tests unless experience with similar batteries and installations has shown that maintaining safe cell temperatures and pressures presents no problem.

(d) No explosive or toxic gases emitted by any battery in normal operation, or as the result of any probable malfunction in the charging system or battery installation, may accumulate in hazardous quantities within the aeroplane.

(e) No corrosive fluids or gases that may escape from the battery may damage surrounding structures or adjacent essential equipment.

(f) Each nickel cadmium battery installation capable of being used to start an engine or auxiliary power unit must have provisions to prevent any hazardous effect on structure or essential systems that may be caused by the maximum amount of heat the battery can generate during a short circuit of the battery or of its individual cells.

(g) Nickel cadmium battery installations capable of being used to start an engine or auxiliary power unit must have –

(1) A system to control the charging rate of the battery automatically so as to prevent battery overheating;

(2) A battery temperature sensing and over-temperature warning system with a means for disconnecting the battery from its charging source in the event of an over-temperature condition; or

(3) A battery failure sensing and warning system with a means for disconnecting the battery from its charging source in the event of battery failure.

(h) In the event of a complete loss of the primary electrical power generating system, the battery must be capable of providing 30 minutes of electrical power to those loads that are essential to continued safe flight and landing. The 30-minute time period includes the time needed for the pilot(s) to recognize the loss of generated power, and to take appropriate load shedding action.

### **SpC VLA 1381     Instrument lights**

The instrument lights must –

- (a) Make each instrument and control easily readable and discernible;
- (b) Be installed so that their direct rays, and rays reflected from the windshield or other surface, are shielded from the pilot's eyes; and
- (c) Have enough distance or insulating material between current carrying parts and the housing so that vibration in flight will not cause shorting.  
A cabin dome light is not an instrument light.

### **SpC VLA 1383     Taxi and landing lights**

Each taxi and landing light must be designed and installed so that –

- (a) No dangerous glare is visible to the pilots;
- (b) The pilot is not seriously affected by halation;
- (c) It provides enough light for night operations; and
- (d) It does not cause a fire hazard in any configuration.

### **SpC VLA 1431     Electronic equipment**

Electronic equipment and installations must be free from hazards in themselves, in their method of operation, and in their effects on other components. For operations for which electronic equipment is required, compliance must be shown against CS-VLA 1309.

### **SpC VLA 1547     Magnetic direction indicator**

- (a) A placard meeting the requirements of this section must be installed on or near the magnetic direction indicator.
- (b) The placard must show the calibration of the instrument in level flight with the engine operating.

(c) The placard must state whether the calibration was made with radio receivers on or off.

(d) Each calibration reading must be in terms of magnetic headings in not more than 30° increments.

(e) If a magnetic non-stabilized direction indicator can have a deviation of more than 10° caused by the operation of electrical equipment, the placard must state which electrical loads, or combination of loads, would cause a deviation of more than 10° when turned on.

### **SpC VLA 1559      Operating limitations placards**

The following placards must be plainly visible to the pilot:

(a) A placard stating the following airspeeds (IAS):

- (1) Design manoeuvring speed,  $V_A$ ;
- (2) The maximum landing gear operating speed,  $V_{LO}$ .

(b) A placard stating ‘This aeroplane is classified as a very light aeroplane approved for day VFR only or day and night VFR, whichever is applicable, in non-icing conditions. All aerobatic manoeuvres including intentional spinning are prohibited. See Flight Manual for other limitations’.

### **SpC VLA 1583      Operating limitations**

(a) Airspeed limitations. The following information must be furnished

(1) Information necessary for the marking of the airspeed limits on the indicator, as required in CS-VLA 1545 and the significance of the colour coding used on the indicator.

(2) The speeds  $V_A$ ,  $V_{Lo}$ ,  $V_{LE}$  where appropriate.

(b) Weights. The following information must be furnished:

- (1) The maximum weight.
- (2) Any other weight limits, if necessary.

(c) Centre of gravity. The established c.g. limits required by CS-VLA 23 must be furnished.

(d) Manoeuvres. Authorised manoeuvres established in accordance with CS-VLA 3.

(e) Flight load factors. Manoeuvring load factors: the following must be furnished:

(1) The factors corresponding to point A and point C of figure 1 of CS-VLA 333 (b), stated to be applicable at VA.

(2) The factors corresponding to point D and point E of figure 1 of CS-VLA 333 (b) to be applicable at VNE.

(3) The factor with wing flaps extended as specified in CS-VLA 345.

(f) *Kinds of operation*. The kinds of operation (day VFR or day and night VFR, whichever is applicable) in which the aeroplane may be used, must be stated. The minimum equipment required for the operation must be listed.

(g) Powerplant limitations. The following information must be furnished:

(1) Limitation required by CS- VLA 1521.

(2) Information necessary for marking the instruments required by CS-VLA 1549 to 1553.

(3) Fuel and oil designation.

(4) For two-stroke engines, fuel/oil ratio.

(h) Placards. Placards required by CS-VLA 1555 to 1561 must be presented.

Issued in Kansas City, Missouri on August 12, 2013.

Earl Lawrence  
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